Mathematics

INVESTIGATION OF LINEAR SYSTEMS WITH PARAMETERS WITH MAPLE

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We discuss some opportunities of using Computer Algebra Systems in teaching Linear Algebra. We concentrate on systems of linear equations containing parameters and on exploration of the dependence of the formula of general solutions on these parameters. Usually only very few simply problems of this kind are considered in the course, since such problem require a lot of technical analytical calculations. However, they are very important not only for deeper understanding of the theory but also in practical calculations.

For example, the following question is very natural. Suppose that a linear system has infinitely many solutions only for some irrational values of parameters. How is it possible to find numerically an approximate formula for the general solution in this case in view of the fact that in numerical computations we deal only with approximate rational values of parameters?

Maple has possibilities to find an analytical formula for the general solution of the given system for any algebraic values of parameters as well as to find the solution numerically for any rational values of parameters. This can help to understand how the problem formulated above can be resolved.

In the case of two parameters, we can demonstrate graphically the regions of the distinct ranks of the augmented matrix of the given system in the plane of parameters.